



**Healthier Planet, Healthier People: Hospitals Go Green to “First, Do No Harm.”** Until the mid 1990s, the healthcare industry fretted little about going green, largely, perhaps, because it enjoyed such a white-glove reputation. What, after all, could be cleaner than a hospital? But then the U.S. Environmental Protection Agency issued a disturbing report that made the industry turn red.



The shame-faced finding: Medical waste incinerators—there were more than 5,000 of them in North America at the time—stacked up as the largest source of dioxin emissions into the atmosphere.<sup>1</sup> That's right, dioxin, one of the most potent carcinogens ever identified.

"It caused a real uproar in local communities," says Adele Houghton, project manager of the *Green Guide for Health Care*, a best-practices tool that hospitals use to improve their environmental performance. The link between hospitals and pollution and pollution and chronic disease suggested a vicious cycle, Houghton says, "especially when your mission is supposed to be 'first, do no harm.'"<sup>2</sup>

That ancient admonition is now becoming the catalyst for change. Widely attributed to the Hippocratic Oath—though at best it's merely a partial paraphrase—"first, do no harm" is the rallying cry for an industry determined to scrub its ecological profile.

Spurred by the embarrassment surrounding medical waste incinerators, the healthcare industry began evaluating other aspects of its operations and didn't like what it found. Healthcare is the biggest generator of waste in the United States, the second-largest consumer of energy, and consistently among the top 10 users of water in any given community.<sup>3</sup> Because it's also the largest industrial sector—expected to account for 20 percent of the U.S. economy by 2015—the impact of conservation efforts elsewhere is limited without healthcare's participation.<sup>4</sup>

Even more alarming, the connection between medical waste and dioxin turned out to be the most glaring example of a broader problem—healthcare not only pollutes, but may be contributing to the very illnesses it's trying to cure. Evidence indicates that asthma, birth defects, childhood brain cancer, leukemia, and infertility are on the rise—and exposure to environmental toxins, it seems, may be linked to all of them.<sup>5</sup>

Where do these toxins come from? Biological waste might grab the headlines, but seemingly innocuous sources like building materials, carpeting, and cleaning products may be more insidious.

On that score, healthcare is hardly the only industry responsible—just the least justifiable. Is it unreasonable, after all, to build cancer treatment centers that don't contain materials linked to cancer? Or to clean pediatric clinics with products that don't trigger asthma. Or, for that matter, to stock the hospital cafeteria with foods that don't contribute to heart disease?

Those are just some of the questions hospital administrators around the world are asking as they grapple with an even more fundamental one: Is it possible to keep people healthy if the earth itself is sick?

"There is a direct link between healing the individual and healing this planet," says Lloyd Dean, president and CEO of Catholic Healthcare West, a leading nonprofit health system



based in San Francisco. “We will not have healthy individuals, healthy families, and healthy communities if we do not have clean air, clean water, and healthy soil.”<sup>6</sup>

### Eco-Friendly Construction Boom

The greening of healthcare began in earnest with a concentrated focus on a pair of issues. The first: Those 5,000 dioxin-spewing medical waste incinerators. Since the damning 1996 EPA report, all but a hundred or so have been shut down.<sup>7</sup> Meanwhile, the industry has sharply curtailed its use of PVC (polyvinyl chloride), the burning of which led to most of that dioxin contamination.

The second issue involves mercury, which can impair the nervous system even after exposure to minuscule amounts. Since 1998, more than 4,000 healthcare facilities have pledged to phase it out in favor of safer alternatives.<sup>8</sup>

Having made considerable progress on these two fronts, the healthcare industry began eyeing a broader ecological swath encompassing energy efficiency, water conservation, waste reduction, indoor air quality—the works.

The timing couldn't be better. In the U.S., decaying facilities and aging baby boomers have pushed the industry into a massive construction boom. Annual capital spending on health facilities is expected to double from \$18 billion in 2006 to \$35 billion by 2010<sup>9</sup> and then continue unabated for much of the ensuing decade. In the U.K., the National Health Service (NHS) has acute-care construction projects in process funded through the private finance initiative that total over £3 billion.

A good percentage of that new construction figures to be eco-friendly. The Minister of State for Health has set mandatory energy efficiency targets for all NHS trusts. They include a 15 percent reduction in primary energy consumption by 2010 (using 2000 as the base year).

In the U.S., the tipping point appears to have occurred early this century. The 2002 publication of the *Green Guide for Healthcare*, the industry bible on sustainable operations and construction, prompted a flurry of interest. Within five years, more than 100 healthcare facilities had signed on as Green Guard pilot projects.<sup>10</sup> Meanwhile, the number of new healthcare facilities that had registered for LEED (Leadership in Energy and Environmental Design) certification with the U.S. Green Building Council jumped from 20 in 2004 to 80 just two years later.<sup>11</sup>

These projects are seeking LEED certification based on current standards for commercial buildings. But because hospitals run all day every day and must adhere to volumes of stringent regulations, designing a green building is especially challenging. The release of LEED guidelines tailored to the unique characteristics of hospitals—expected to be available in 2007—should spur the greening of healthcare even more.

Want firsthand evidence of how quickly the industry has turned green? Ask Tyler Krehlik. As sustainability chair for Anshen+Allen, a San Francisco-based architectural firm that specializes in healthcare projects, Krehlik is on the front lines of the movement.

"In 2006, at least 90 percent of the RFPs we responded to wanted to know about our experience with green design," Krehlik says. "A couple of years earlier, it was just a handful. Plus, interest is coming from all over the country, not just from places like California and Oregon."<sup>12</sup>

### In the LEED

Or, perhaps, Boulder, Colorado. Though far inland, Boulder has long had a coastal attitude toward the environment. It's little surprise, then, that the city synonymous with all things green is home to the first hospital in the United States to earn LEED certification.<sup>13</sup> Consequently, many healthcare facilities looking to green up their operations look there first—to Boulder Community Foothills Hospital—to see what's possible.

At first blush, there's little about the facility that says green. Look closer, however, and green virtues seep from every pore. For starters, more than half of the materials used to construct the building were manufactured locally.<sup>14</sup> The hospital also used low-emitting paints, adhesives, and carpeting to improve indoor air quality.

To conserve water, Boulder Foothills uses waterless urinals and electric-eye faucets in the restrooms. Outside, it favors plants native to Colorado, which require about half the irrigation of a conventional landscape.<sup>15</sup>

For energy savings, the hospital built a highly efficient central utility plant and installed special sensors throughout—some that automatically shut off the lights when rooms empty, others that automatically turn off the air conditioning if a patient opens the window. One wing was even built at a precise angle to the sun so that rooms get as much natural light—and use as little electricity—as possible.<sup>16</sup>



Boulder Foothills also nudged employees toward alternative transportation by issuing bus passes, creating priority parking for carpoolers, and installing showers to encourage bicyclists to pedal to work.<sup>17</sup> Several parking spaces even double as charging stations for employees with electric cars.<sup>18</sup> Says Kai Abelkis, the hospital's environmental coordinator: "Building a sustainable building is a great opportunity to set the tone for your hospital in your community."<sup>19</sup>

Bluewater Health would agree. The Sarnia, Ontario, hospital expects to be among the first LEED-certified healthcare facilities in Canada once it completes construction of a 350,000-square-foot addition. To score points with LEED (the program is also recognized by the Canada Green Building Council), Bluewater plans to use local building materials, specify low-emitting interior finishes, capture rainwater for irrigation, and install low-consumption plumbing fixtures. What's more, visible roof areas will be planted with wildflowers and local grasses to keep the views green, too.

Don Hall, a Bluewater vice president who heads up facilities planning, anticipates the hospital will earn back the money it spent on green construction within seven years, thanks largely to lower utility costs.<sup>20</sup>

## Top Strategies for Going Green

Whether healthcare facilities take incremental steps or a comprehensive approach via new construction, here are some of the top strategies for going green, starting with the two most prominent—mercury and PVC.

### Mercury No More

Once found throughout healthcare facilities—in thermometers, blood pressure devices, lab chemicals, and cleaners—mercury is now well on the way toward being eliminated.

In the U.S., the industry moved fast to set things right after an EPA report identified hospitals as the fourth-largest source of mercury discharge into the environment.<sup>21</sup> Soon after, in 1998, a trio of health organizations joined the EPA to launch Hospitals for a Healthy Environment, a program that has since evolved beyond its mercurial roots to serve as a comprehensive resource for sustainability.

In Europe, it's estimated that at least 3 million people (perhaps as many as 15 million) have elevated mercury levels in their bodies. Faced with such alarming figures, the European healthcare industry needed no further incentive to make some changes. Sweden, Norway, and Denmark, for example, are among the nations that have banned mercury-containing medical devices.<sup>22</sup>

Fortunately, cost-effective alternatives exist for most healthcare products that might otherwise contain mercury. That's less true in developing countries, but demand for digital thermometers and other mercury alternatives is beginning to emerge even there. The rapid eradication of mercury serves as compelling evidence of how the healthcare industry can use its collective clout to carry the banner for environmental change. Since hospitals decided to tackle the problem, all major U.S. pharmacy chains have eliminated the sale of mercury thermometers, while dozens of states have passed laws restricting mercury-based products.<sup>23</sup>

### PVC—Going, Going ...

PVC, or polyvinyl chloride, is the most widely used plastic in medicine, found primarily in IV bags, tubing, and gloves.<sup>24</sup> It's also commonly used in a variety of building materials, including flooring, carpeting, wall coverings, and pipes.

Unfortunately, PVC's high chlorine content poses a big problem because it forms cancer-causing dioxin as a byproduct when manufactured and incinerated. Plus, a

softening agent called DEHP can leach from PVC medical products, possibly contributing to birth defects.<sup>25</sup>

Industry alarm over responsibility for dioxin contamination led to the formation of Healthcare Without Harm, an international coalition with a self-explanatory name. The group counts the shuttering of most medical waste incinerators in North America among its most notable successes.

Though efforts to reduce PVC usage are primarily taking place in Europe, the U.S., and Japan, the developing world also is making a difference. India, for example, has outlawed PVC incineration since 1998, and China has indicated an interest in banning PVC medical products, a move that could create huge global demand for PVC-free alternatives.<sup>26</sup>

Among the leaders in the U.S. are Catholic Healthcare West, which plans to use PVC-free IV bags, solutions, and tubing in all 40 of its hospitals in California, Arizona, and Nevada.<sup>27</sup>

Also on the vanguard are Hackensack University Medical Center in New Jersey, the U.S.'s fourthlargest hospital; and California-based Kaiser Permanente, the nation's largest nonprofit health system. Both have found that avoiding PVC in interior finishes can produce ancillary benefits.

One example: flooring. Though modestly more expensive to install than vinyl, PVC-free alternatives like rubber can cost less over the long run. For starters, maintenance is less expensive because rubber floors don't need to be stripped and waxed. Plus, healthcare workers tend to prefer rubber flooring because it's easier on the feet when standing for long stretches. Another bonus: It's harder to slip and fall on rubber than it is on vinyl, which pays off in fewer injuries to patients and staff.<sup>28</sup>

## Energy and Water Conservation

Because most healthcare facilities are occupied around the clock, they must be especially creative when it comes to conservation. Using night setbacks for the heating system or turning off unused lights at the end of the day typically aren't viable options. Besides, flow restrictors and electronic sensors on faucets only go so far.

Few facilities have tackled conservation quite as comprehensively as the Patrick H. Dollard Discovery Health Center in upstate New York, another early recipient of LEED certification. Here, exterior shades and a reflective metal roof reduce heat gain—and, therefore, cooling demand—in summer, while passive solar technology trims heating demand in winter. Result: The building uses about 25 percent less energy than it would without the energy upgrades.<sup>29</sup>

As for water, among the ways the Discovery Health Center keeps usage to a minimum is by channeling storm water into a pond, which feeds a sprinkler reserve for fire

suppression. The building was sited to preserve prime farmland, so there's no landscape to speak of—at least none that needs to be irrigated.<sup>30</sup>

## A Breath of Fresh Air



According to the U.S. Environmental Protection Agency, indoor air pollution ranks among the top five environmental risks to public health.<sup>31</sup> In addition, the European Union Parliament considers it the major cause of acute respiratory infections, the main cause of death in children under age five in Europe.<sup>32</sup>

The source of all that pollution? Much of it comes from the materials commonly used to construct and outfit buildings. Carpeting, furniture, insulation, and other interior finish products tend to release contaminants gradually over time, whereas products applied wet—paints, stains, and adhesives—are more likely to produce harmful emissions immediately after application.<sup>33</sup>

Broadly, these contaminants are called volatile organic compounds, or VOCs, the most notable of which is formaldehyde, a probable carcinogen. VOCs are associated with a host of health problems that at the very least may lead to longer recovery times for patients and more sick days for staff. They can be especially hazardous for respiratory patients or those with depressed immune systems.<sup>34</sup>

To combat the ill effects, many hospitals have begun insisting on low- or no-VOC alternatives. Low-VOC paints, stains, finishes, adhesives, and sealants are all readily available, as are furnishings certified as low-emitting by the GREENGUARD Environmental Institute, which sponsors an independent testing program. For even more thorough eradication of VOCs, options include sustainable wheatboard instead of standard millwork or recycled cotton insulation instead of fiberglass.<sup>35</sup>

Palomar Medical Center West, scheduled to open in 2011, is among those taking an aggressive stance. Planners for the Escondido, California, hospital are reviewing the material content of every single product used in construction to ensure the air patients breathe is as healthful as possible.<sup>36</sup>

## Clean and Green

Construction isn't the only source of VOCs in healthcare facilities; maintenance releases them, too, primarily in the form of emissions from cleaning products. The irony is that these products eliminate dirt and germs at the risk of producing unintended consequences that are far worse.

Once the link between cleaning products and VOCs became apparent, many healthcare facilities began scrutinizing the chemicals in their janitorial closets. Here again, Hackensack University Medical Center played a leading role.

The facility's pediatric oncology center developed a list of hazardous ingredients to avoid—and eco-friendly products to use instead—after becoming alarmed by the possible cancer-contributing attributes of certain cleaning agents. Dubbed “Greening the Cleaning,” the protocol has since been implemented throughout the university's entire medical campus.<sup>37</sup>

### **Addressing Medical Waste?**

Disposal of medical waste has become an intractable problem for hospitals and research labs in the U.S. now that incineration and landfill options are limited. In Europe, incineration remains the prevailing disposal method, though many incinerators closed following the introduction of stricter emission limits by the European Union in 2000.<sup>38</sup>

In developing countries, attitudes toward incineration run the gamut. Whereas the practice is banned in some countries—the Philippines being one example—it's considered business as usual in most. Rural hospitals in many poorer countries frequently burn medical waste in open fields or small incinerators that lack pollution controls.<sup>39</sup>

To combat the problem, Health Care Without Harm is collaborating with the World Health Organization to fund the development of low-cost non-incineration technologies.

The private sector is also working on solutions. A promising technology being developed by Medergy Corporation of San Francisco, for instance, leverages a process called “steam reformation” to detoxify hazardous medical waste by heating it to 1,900 degrees. The high temperature alters the chemical composition of the waste, reducing its weight by 80 percent and rendering it inert.

Better still, the process produces a hydrogen-rich gas that can power fuel cells, which in turn could generate electricity. Another byproduct shows promise as an additive in concrete and asphalt.<sup>40</sup>

### **Finding Green Suppliers**

After a healthcare facility commits to selecting green medical products and building materials, the next challenge is finding them. That's becoming less of a problem by the day.

Consider furnishings: With modest effort, hospitals can choose furniture that's built from sustainable materials, that contains high recycled content, that emits no VOCs, and that's largely recyclable.

Modular casework and workstations present another green strategy. Before their introduction, reconfiguring a healthcare space often meant demolishing fixed walls, ripping out cabinets, and choking landfills with waste. Nowadays, it's often as simple as moving a few workstation panels around or reusing modular casework elsewhere.

“Hospitals must reconfigure frequently to keep up with changes in technology, staffing, and operations,” says Roger Call of Herman Miller for Healthcare. “When a space needs

to be changed around, modular casework and systems offer much greater value because they can be reused, as opposed to built-ins, which have to be torn out and thrown away.”<sup>41</sup>

As for those market sectors that have yet to offer green alternatives, it has become clear that the industry can leverage its considerable purchasing power to be sure they do. Case in point: Kaiser Permanente’s carpet. Failing to find carpet that met its stringent specifications—no PVC, low emissions, high recycled content—Kaiser Permanente challenged its suppliers to fill the void. One did, inventing a carpet that has a backing made from polyvinyl butyral, which is recovered from the windshields of cars destined for the scrap heap. Kaiser Permanente has pledged to use the product in all new construction.<sup>42</sup>

## Daylight and Views

A landmark 1984 study published in *Science* evaluated surgical patients recuperating on the same corridor, half of whom overlooked trees and half of whom overlooked a brick wall. The principal finding: Patients with views of nature went home sooner, used less medication, and exhibited better emotional wellbeing.<sup>43</sup> Since then, a growing body of research suggests that connection to the natural world aids healing by reducing stress and preoccupation with pain.<sup>44</sup>

Accordingly, daylighting—bringing daylight indoors via the likes of transoms, skylights, and clerestory windows—has become de rigueur among hospitals with green ambitions, especially since it also tends to save electricity. So, too, has the emphasis on natural views both outdoors and in, often in the form of healing gardens.

Few facilities have embraced daylighting as thoroughly as Dublin Methodist Hospital in Dublin, Ohio, which managed to achieve it in 90 percent of all occupied spaces.<sup>45</sup> Meanwhile, few have integrated nature as ably as the Christus St. Michael Health System campus in Texarkana, Texas, which was designed with no fewer than 17 gardens for meditation, relaxation, dining, and meetings.<sup>46</sup>

## Eating Well

The greening of healthcare also has focused the industry on the importance of adopting food-procurement policies that are nutritionally sound and ecologically sustainable. After all, poor nutrition is a risk factor for four of the six leading causes of death—heart disease, stroke, diabetes, and cancer.<sup>47</sup>

Among the strategies recommended by Health Care Without Harm: seek sources for organic food, plant on-site gardens, favor locally grown produce, avoid milk and meat produced with synthetic hormones or non-therapeutic antibiotics, and turn hospital campuses into “fast-food-free zones.”

Also gaining popularity are on-site farmers markets, which support sustainable agriculture while providing employees and the surrounding community easy access to healthy, affordable food. Duke University Medical Center in Durham, North Carolina, Allen

Memorial Hospital in Waterloo, Iowa,<sup>48</sup> and more than two dozen Kaiser Permanente facilities are among those that have gone this route, helping themselves to an extra-large portion of community goodwill in the process.<sup>49</sup>

## Why Go Green?

On one point, the administrators and facility managers of most healthcare facilities agree: Going green is the right thing to do. Once they get beyond that sense of obligation, however, they invariably discover plenty of bottom-line benefits.

Some facilities see it as a natural extension of their mission. Others, as a way to attract scarce staff and keep them healthy, on the job, and disinclined to look for work elsewhere. Still others see it as a competitive advantage, a way to differentiate themselves—and maybe even score some favorable publicity—in a crowded marketplace.

The cost of greening seems to cut both ways. For the most part, healthcare leaders report modest firstcost increases attributable to green design—as much as 10 percent by some estimates,<sup>50</sup> though Boulder Foothills pegs its premium for achieving LEED certification at just 2 percent.<sup>51</sup>

Over time, however, many green initiatives unquestionably return more than they cost. Beth Israel Deaconess Medical Center in Boston, Massachusetts, for instance, figures that upgrades aimed at conserving water and energy save more than half a million dollars per year.<sup>52</sup>

For a look at how green innovations outside the mainstream can pay off, look to Kaiser Modesto Medical Center in California. The facility covered its parking lot with porous pavement that acts as a natural filter during heavy rains, removing chemicals before the water seeps into the ground. Though more expensive than asphalt, the material eliminated the need for storm sewer drains, saving nearly \$300,000.<sup>53</sup>

But perhaps the most compelling argument in favor of going green is this: What better industry to take the lead?

Healthcare has historically led society toward changes that are for its own good, including raising awareness of mercury, lead, and smoking.<sup>54</sup> Equally significant, hospitals reach people at a time when they're especially vulnerable and, therefore, educable. Having undergone an experience that often forces them to ponder quality-of-life issues, patients are more apt to adopt a greener attitude of their own once they go home.

The time is coming quickly—perhaps it's already here—when communities will question hospitals that lack eco-friendly features. Says Robin Guenther, principal of Guenther 5 Architects in New York, one of the country's foremost healthcare design firms: “My big piece of advice is to be much more proactive about (green design) now, because this thing is going like a house on fire.”<sup>55</sup>

## Notes

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- <sup>24</sup> Berry, Leonard L., et al, "The Business Case for Better Buildings," *Frontiers of Health Services Management* (Fall 2004), p. 12.
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